



**OCT 12 2013**

10CFR50.73

LR-N13-0240

United States Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-001

Hope Creek Generating Station Unit 1  
Renewed Facility Operating License No. NPF-57  
Docket No. 50-354

Subject: Licensee Event Report 2013-002-01

Reference: Letter LR-N13-0162 dated August 8, 2013  
Licensee Event Report 2013-002-00

The Reference, Hope Creek Generating Station (HCGS) Licensee Event Report (LER), reported a reactor scram due to a degrading condenser vacuum caused by the trip of the 'B' circulating water pump. The Reference stated that HCGS would supply a supplement to the LER with the results of the root cause evaluation performed to determine the cause of pump trip. The results of the root cause evaluation are being communicated in the LER supplement attached to this letter.

Should you have any questions concerning this letter, please contact Mr. Paul Bonnett at (856) 339-1923.

No regulatory commitments are contained in the LER.

Sincerely,

A handwritten signature in black ink, appearing to read "Eric S. Carr", with a long horizontal flourish extending to the right.

Eric S. Carr  
Plant Manager  
Hope Creek Generating Station

Attachment: Licensee Event Report 2013-002-01

cc: Mr. W. Dean, Regional Administrator – Region I

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U.S. Nuclear Regulatory Commission  
2100 Renaissance Blvd, Suite 100  
King of Prussia, PA 19406-2713

Mr. J. Hughey, Project Manager  
U.S. Nuclear Regulatory Commission  
One White Flint North  
Mail Stop O8 B1A  
11555 Rockville Pike  
Rockville, MD 20852

USNRC Senior Resident Inspector – Hope Creek (X24)

P. Mulligan, Manager  
Bureau of Nuclear Engineering  
New Jersey Department of Environmental Protection  
PO Box 420  
MC 33-01  
33 Arctic Parkway  
Trenton, NJ 08625

Hope Creek Commitment Tracking Coordinator (H02)

Corporate Commitment Tracking Coordinator (N21)

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to [Infocollects@nrc.gov](mailto:Infocollects@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

## 1. FACILITY NAME

Hope Creek Generating Station

## 2. DOCKET NUMBER

05000354

## 3. PAGE

1 OF 4

## 4. TITLE

Reactor Scram due to Degrading Condenser Vacuum

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED																																					
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER																																				
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10. POWER LEVEL																																														
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## 12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

Paul Bonnett, Sr. Compliance Engineer

TELEPHONE NUMBER (Include Area Code)

856-339-1923

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	SG	P	I075	Y	B	SG	V	P340	Y

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO

## 15. EXPECTED SUBMISSION DATE

MONTH

DAY

YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On June 12, 2013, at 13:33, Hope Creek Unit 1 was manually scrambled from approximately 100 percent rated thermal power due to degrading main condenser vacuum. This condition occurred due to the trip of the 'B' circulating water (CW) pump with the 'B' CW discharge valve stuck in the full-open position. Operators initiated a manual scram when condenser vacuum reached 6.5 inches of mercury absolute (HgA). During the scram response, the operating reactor feed pump tripped due to degrading vacuum and the operators manually placed the reactor core isolation cooling (RCIC) system in service for reactor inventory control. Operators completed the scram response procedures and placed the plant in a stabilized hot shutdown condition.

Immediate corrective actions included replacing the 'B' CW discharge valve and replacing the auxiliary relay card for the 'B' CW pump trip during the forced outage. Additional corrective actions include establishing a program for performing failure analysis, "metallic whisker" evaluations, and trending of circuit card failures in accordance with INPO and EPRI recommendations, and establishing a preventative maintenance program for replacement of the Bailey auxiliary relay cards.

The cause of the 'B' CW pump trip was due to conductive filament growth that bridged across two solder traces on the auxiliary relay card, creating a short circuit, and generating a CW pump trip signal.

This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A) as a valid manual actuation of the reactor protection system and manual initiation of the RCIC system.

NRC FORM 366A  
(10-2010)

# LICENSEE EVENT REPORT (LER) U.S. NUCLEAR REGULATORY COMMISSION

## CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Hope Creek Generating Station	05000354	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		2013	- 002	- 01	

**NARRATIVE****PLANT AND SYSTEM IDENTIFICATION**

General Electric – Boiling Water Reactor (BWR/4)  
 Condenser System – Circulating Water Pump – {SG/P}\* - EIS Identifier  
 Condenser System – Circulating Water Discharge Valve – {SG/V}\* - EIS Identifier  
 Reactor Protection System – {JC/NA}\* - EIS Identifier

\*Energy Industry Identification System {EIS} codes and component function identifier codes appear as {SS/CCC}

**IDENTIFICATION OF EVENT**

Event Date: June 12, 2013  
 Discovery Date: June 12, 2013

**CONDITIONS PRIOR TO EVENT**

Hope Creek was in Operational Condition 1 at 100 percent rated thermal power (RTP). The 'C' service water pump was inoperable for planned maintenance and the reactor core isolation cooling (RCIC) system was in service for quarterly inservice testing. The status of these two systems did not contribute to the event. The plant was operating with the 'B' circulating water discharge valve stuck in the full-open position. This condition did contribute to this event.

**DESCRIPTION OF EVENT**

On June 12, 2013, at 13:32 EDT, the 'B' circulating water (CW) pump {SG/P} tripped with the 'B' CW discharge valve {SG/V} stuck in the full-open position resulting in a degrading vacuum. In accordance with plant procedures, the operators lowered reactor power from 100 percent in an effort to stabilize condenser vacuum. When vacuum reached 6.5 inches of mercury absolute (HgA), the operators initiated a manual reactor scram {JC/NA} at 13:33, in accordance with plant procedures. All control rods inserted as required and all systems functioned as expected following the scram. The 'A' reactor feed pump turbine (RFPT) was in service for reactor pressure vessel (RPV) inventory control. No automatic emergency core cooling system (ECCS) or reactor core injection cooling (RCIC) system initiations occurred. No primary or secondary containment isolations occurred. At the time of the event, a RCIC quarterly inservice test was in progress, but did not contribute to the event. Operators secured the RCIC pump and restored it to a standby lineup. At approximately 14:00, the main condenser vacuum further degraded due to two redundant sealing steam supply valves failing to reposition as designed causing the RFPT to trip. The RFPT could not be recovered and as a result, the operators manually placed RCIC in service for RPV inventory control. At 14:50, operators secured RCIC and controlled reactor level with the secondary condensate pumps. Operators completed the scram response procedures and placed the plant in a stabilized hot shutdown condition.

At 16:59 EDT, on June 12, 2013, Hope Creek made a 4-hour notification to the NRC under 10 CFR 50.72(b)(2)(iv)(B) for an actuation of the reactor protection system (RPS), and an 8-hour notification under 10 CFR 50.72(b)(3)(iv)(A) for a valid manual initiation of the RCIC system (Event Number 49108).

LICENSEE EVENT REPORT (LER) U.S. NUCLEAR REGULATORY COMMISSION

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**NARRATIVE**

This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A) as a valid manual actuation of RPS and manual initiation of the RCIC system.

**Additional Background**

On May 7, 2013, the 'B' CW discharge valve failed to stroke from OPEN- FULL to OPEN-MID while attempting to remove the 'B' CW pump from service for maintenance. The CW discharge valves are model Triton XR-70, 84 inch, butterfly valves manufactured by PRATT. The valves are operated hydraulically by a hydraulic power unit. Initial troubleshooting revealed the valve was unable to be stroked closed. An Operational and Technical Decision Making (OTDM) document determined the acceptability of continued operation with the degraded discharge valve until it could be repaired in the fall refueling outage. The evaluation acknowledged the risk of a reactor scram on low condenser vacuum, especially during the summer months.

**CAUSE OF EVENT**

The cause of the 'B' CW pump trip was due to conductive filament growth that bridged across two solder traces on auxiliary relay card, creating a short circuit, and generating a CW pump trip signal. Conductive filaments are a phenomenon similar to "metallic whiskers." In this phenomenon, minute "whiskers" grow between circuit card solder traces causing a short circuit. The failure analysis on the auxiliary relay card conducted by an external vendor identified the presence of conductive filaments and a burn mark associated with a short circuit. The burn mark on the card was across two contacts that could have energized the relay to provide a trip signal to the pump. Previous to the identification of conductive filament growth, there was no identified failure mode that would cause a normally de-energized relay to activate.

Two root causes were determined to have contributed to this event.

The first root cause is that Hope Creek has not implemented a conductive filaments or metallic whiskers inspection program. The presence of conductive filaments on the Bailey auxiliary relay cards was sufficient to produce the trip signal for the pump.

The second root cause is the station's lack of a preventative or predictive maintenance program for the CW pump Bailey auxiliary relay cards.

**SAFETY CONSEQUENCES AND IMPLICATIONS**

There were no nuclear safety consequences associated with this event. All control rods fully inserted following the initiation of the manual reactor scram. There were no automatic initiations of safety systems, and immediate actions performed by the operators were adequate and appropriate in placing and maintaining the reactor in a safe shutdown condition. The loss of condenser vacuum classified the event as an unplanned scram with complications in accordance with NEI 99-02; however, it is concluded that the safety significance of this event was low and the event did not pose a threat to the health and safety of the public or plant personnel.

CONTINUATION SHEET

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**NARRATIVE**

**SAFETY SYSTEM FUNCTIONAL FAILURE**

A review of this event determined that a Safety System Functional Failure (SSFF) as defined in NEI 99-02, "Regulatory Assessment Performance Indicator Guidelines," did not occur. This event did not prevent the ability of a system to fulfill its safety function to either shutdown the reactor, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident.

**PREVIOUS EVENTS**

A review of similar events at Hope Creek dating back to 2006 identified the following previous occurrences; however, none of these events resulted in a degraded vacuum and reactor scram.

June 6, 2006 – The 'B' CW pump tripped unexpectedly. Inspection of the area did not identify any breaker or relay flags picked up. A Bailey logic module was found to be failed and was replaced. The corrective actions were specific to this event and would not have prevented the current event from occurring.

January 8, 2008 – The 'A' CW pump tripped unexpectedly. The corrective action included replacing the 50G ground relay. The relay was inspected by an external vendor for metallic whiskers, and none were found. However, a subsequent inspection of the Bailey auxiliary relay card in September 2013 found evidence of conductive filaments.

May 18, 2011 – The 'B' CW pump unexpectedly tripped. Failure analysis of the removed 50G relay from the 'B' CW pump was completed with no degraded component identified. The corrective actions were specific to this event and would not have prevented the current event from occurring.

**CORRECTIVE ACTIONS**

1. The 'B' circulating water discharge valve was replaced during the forced outage.
2. Replaced the auxiliary relay card for the 'B' CW pump and the 'A' CW pump during the forced outage.
3. Establish a program for performing failure analysis, "metallic whisker" evaluations, and trending of circuit card failures in accordance with INPO and EPRI recommendations.
4. Establish a preventative maintenance program for replacement of the Bailey auxiliary relay cards.

Additional corrective actions are being tracked in the corrective action program.

**COMMITMENTS**

This LER contains no regulatory commitments.